F43 Changing Forensic Science Practice to Meet the Demands of Law and Science

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After attending this presentation, attendees will learn how forensic science fits into the broader area of applied science and how modest changes in practice could resolve long-standing problems with the use of science in the courts.

This presentation will impact the forensic science community by illustrating how science operates and how changes to forensic science in the legal system can meet the needs and expectations of science and the legal community.

Since its inception, forensic science has been caught between potentially conflicting demands of science and the practical needs of courts. For more than a century, establishing the validity of scientific information and methods has challenged courts. In the United States, the *Frye* and *Daubert* Rules are examples that attempt to address this issue, but continuing problems in the availability, admissibility, and accuracy of forensic science all illustrate the continuing dilemma of how to use scientific evidence in court.

Despite many claims to the contrary, there is no single scientific method nor a single arbiter of scientific validity. Fundamentally, science postulates that objective reality exists, and understanding this reality through observation is the scientific process. From these premises, science operates through: (1) direct observation; (2) manipulated observations (the experimental process); and, (3) predicted observation (with predictions arising from models of various types). Scientific truth is established through objective evaluations of data, the observations themselves, and through replication and review, evidence that observations are valid and repeatable. The applied sciences — agriculture, engineering, medicine, and forensic science — use science to address questions of practical importance. Most applied sciences are self-correcting, bad science or bad applications lead to obvious consequences; such as failing crops, dead patients, or collapsed bridges. In contrast, as currently practiced, forensic science has no self-correction mechanisms.

The problems identified by the National Academy of Sciences in their Report on forensic science speak to this lack of self-correction. Fortunately, such a solution exists in that most basic science also lacks mechanisms of immediate self-correction. Science has resolved this problem through its requirements of replication and peer-review of evidence. Open access to data, methods, and conclusions allow peers to evaluate and test (as appropriate) the legitimacy of those same data, methods, and conclusions. Thus, the solution for forensic science is to embrace this same mechanism.

The changes necessary to implement such a mechanism are straightforward. First, in science, the peer-reviewed scientific publication represents the definitive statement of a research finding. By analogy (although it has importance beyond the statement of an analytic conclusion), the case report of a forensic scientist offers the data, analysis, and conclusions from associated evidence. So, the first change needed is that written reports should be required for all scientific testimony, which is already required in some countries (e.g., the United Kingdom). Second, all case reports should be published and peer-reviewed after adjudication, with reviews published with reports. With the advent of electronic publishing, this requirement can be met through existing publication mechanisms, ideally through organizations, such as the American Academy of Forensic Sciences. Models for online publication and

open review and commentary also exist through journals such as *PeerJ* and offer not only a method for validating findings, but also an opportunity for new insights and evaluations. Finally, indications of problems in a case report through publication and peer-review should be potential grounds for an appeal.

This approach leaves the questions of validity of techniques and conclusions to those most qualified to evaluate scientific information — other scientists. It provides a mechanism to ensure consistency in how experts apply their analyses and for self-correction currently lacking in forensic science. Ultimately, it allows courts access to not only experts in the case, but to the broader scientific community.

Science, Forensic Science, Reform